

Pt or Rh, or an alloy consisting essentially of those metals, the thermal stability for the resistance change rate could be increased especially when the free layer is of a CoFe alloy.

In Fig. 27, a pair of longitudinal bias layers 15 and a pair of electrodes 16 which are the same as those in Fig. 21 constitute, along with the spin valve film 14, a spin valve device 13. Like in Fig. 21, an upper gap layer 17 and an upper shield 18 are formed to cover the device 13.

Fourth Embodiment:

Fig. 29 shows still another embodiment of the invention, which is applied to a dual-type spin valve structure.

In Fig. 29, a pair of longitudinal bias layers 15, a pair of electrodes 16, a longitudinal bias layer 15, and a spin valve device 13 comprising a spin valve film 14 are formed on a lower shield 11 and a lower gap 12, and an upper gap 17 and an upper shield 18 are formed over them, like in Fig. 21 for the second embodiment and in Fig. 27 for the third embodiment. However, the structure of Fig. 29 differs from those of Fig. 21 and Fig. 27 in point of the spacing between the electrodes 16 and of the constitution of the spin valve film 14.

The spin valve film 14 comprises a nonmagnetic underlayer 141 of Ta, Nb, Zr, Hf or the like having a thickness of from 1 to 10 nanometers, an optional second underlayer 142 having a thickness of from 0.5 to 5 nanometers, an antiferromagnetic layer 143, a pinned magnetic layer 144, an

interlayer 145 having a thickness of from 0.5 to 4 nanometers, a free layer 146, a second interlayer 148 having a thickness of from 0.5 to 4 nanometers, a second pinned magnetic layer 149, a second antiferromagnetic layer 150, and an optional protective layer 147 having a thickness of from 0.5 to 10 nanometers.

At least one of the pinned magnetic layer 144 and the pinned magnetic layer 149 is a laminated, pinned magnetic layer, which comprises a ferromagnetic layer A, an antiferromagnetically coupling layer and a ferromagnetic layer B as in Fig. 17. In this, employable is any of 1) a combination of an SyAF-type pinned magnetic layer for the pinned magnetic layer 149 and a conventional, single-layered pinned magnetic layer for the pinned magnetic layer 144, 2) contrary to 1), a combination of an SyAF-type pinned magnetic layer for the pinned magnetic layer 144 and a conventional, single-layered pinned magnetic layer for the pinned magnetic layer 149, or 3) a combination of SyAF-type pinned magnetic layers for both the pinned magnetic layer 149 and the pinned magnetic layer 144.

The longitudinal bias layers 15 have a so-called abutted junction type device structure. These may be formed according to a lift-off method, like in Fig. 17, Fig. 27 and Fig. 28. Briefly, the track edges of the spin valve film are etched away via a photo-resist mask, and thereafter the longitudinal bias

layers 15 are formed through sputtering, vapor deposition, ion beaming or the like. In this process, the etching removal of the spin valve film 14 is preferably so effected that at least the conductor layer part of the spin valve film 14 is left as it is without being removed. For example, when the antiferromagnetic layer 143 is of a γ -Mn-based alloy such as IrMn, it is desirable that at least a part of the antiferromagnetic layer 143 is left as it is.

If the conductor part is left in the track edges, the contact resistance of the abutted junction structure is lowered, and therefore the resistance of the spin valve device 13 could be lowered with ease. With the low-resistance spin valve device 13, heads could have high resistance to static electricity. Needless-to-say, the spin valve film at the track edges may be completely etched away with no problem to form the longitudinal bias layers.

The electrodes 16 may be formed along with the longitudinal bias layers in one and the same lift-off method. In this case, the spacing between the electrodes is nearly the same as that between the longitudinal bias layers. Alternatively, the formation of the electrodes may be effected separately from that of the longitudinal bias layers to form a so-called lead-overlaid structure in which the spacing between the electrodes is narrower than that between the longitudinal bias layers. The merit of the lead-overlaid